THE JOURNAL of the

NATIONAL ASSOCIATION of COLLEGE TEACHERS OF AGRICULTURE

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Volume V November, 1961 Number 2

• EDITORIAL

MEMBERSIP . . .The National Association of College Teachers of Agriculture should have a membership of 1000. This is an arbitrary and compromising figure since there are many more than 1000 potential members. A few years ago the organization lowered the dues to encourage a larger membership.

Many state colleges understand the value of such an organization as NACTA because they have already reaped numerous benefits by being associated with **a** national organization that proposes to encourage self-improvement of its members and to gain recognition for their work in training students in the field of Agriculture.

Accrediting agencies seem to demand respect. In a sense, NACTA has served in an accrediting capicity in some cases and can easily develop in an accrediting **agency** that will fill a serious need - still felt by many of the state and private colleges. Have you thought about the organizatoin and **your** school in this respect?

The organization is making a special effort this year to increase its membership. Dr. Roy Joe Stuckey of Wilmington College, Wilmington, Ohio, is chairman of the membership committee. He is being assisted in his efforts to enlist members by the regional directors, namely Laurie Pearson, Hal B. Barker and J. R. Wells, The Program Chairman for the 1962 conference, Dr. Lloyd Dowler, Dean of Agriculture, Fresno State College, is heading an excellent drive to enlist members on the West Coast. Efforts of the Journal staff have been rewarded by a number of new memberships.

Would you, as a member of the organization, ask several people to join and assist them in submitting their names to the Secretary? Would you as a person interested in the teaching of agriculture, join the organization now and ask your colleagues to join with you.

ONE THOUSAND; WHY NOT?

THE NUMBERING OF THE JOURNALS

"Only those who no longer are alive make mistakes", someone has has said. It is obvious at this point (and most confusing) that the present editor in setting up the numbering system for the publication used very poor judgement in inventing a "convention" year instead of using the calendar year. In order to prvent further confusion, we are starting to number on a calendar-year basis with the first issue in 1962. For the benefit of "whom it may concern" we are listing below, the issues of the journal that have appeared. It is a well-konwn fact that a regular quarterly schedule has not been followed.

The first two issues were called NEWELETTERS; since the third issue the term JOURNAL has been used.

Vol 1, No. 1—November 1957
Vol 1, No. 2—February 1958

Vol II, No. 1—August 1958
Vol. II, No. 2—February 1959

Vol. III, No. 1—May 1959
Vol. III, No. 2—November 1959
Vol. III, No. 3—February 1960

Vol IV, No. 1—August 1960
Vol. IV, No. 2—March 1961

Vol V, No. 1—August 1961
Vol, V, No. 2—November 1961

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THE

JOURNAL

of the

NATIONAL ASSOCIATION OF

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The NACTA Journal is published quarterly and is mailed in February, May, August and November. This issue was printed and mailed in Ruston, Louisiana. Susbcription price is $3.00 per year. All correspondence relative to subscriptions should be directed to Mr. W. Clyde Hyder, Secretary of NACTA, Tennessee Polytechnic Institute, Cookeville, Tenneessee. All articles for publication should conform to regulations published in the August 1961 issue of the Journal and should be mailed to John A., Wright, Editor, Louisiana Polytechnic Institute, Ruston, Louisiana by the 15th of the month prior to the above designated mailing date.

PRESIDENT'S MESSAGE

Reflections On YOU and YOUR Association

" . . . to coordinate and improve college teaching in agriculture; to make available college instruction in agriculture to the greatest number of people; to encourage and promote research in agriculture among members of the association." Thus are stated in the constitution of the National Association of College Teachers of Agriculture the purposes for which **YOUR NACTA** was established. Since the formal organization and adoption of the constitution in 1956 at the second annual meeting, there have been five years and five conferences in which to work toward the goals established. These purposes for which NACTA was brought into existence are goals not in the ordinary sense, but are objectives which are always on the horizon and never actually get reached in their fullest. This is not at all a unique situation but is a reality which should always be borne in mind if the association is to grow in strength and stature.

Circumstances prevented the writer from attending the first two conferences, but it has been my privilege to attend and take an active part in the past five annual meetings. I have come away from each conference with much more than I had upon my arrival — new ideas with which to approach old- common every-day problems, and in a few instances old ideas remodeled and dressed up to attack new problems.

Placement of graduates is of concern to every institution and there comes to mind Springfield, Missouri, 1960, and Mr. D. Howard Doane with his hard-hitting remarks in "The Future For Agriculture Graduates"; and at the same conference, Mr. Jean Paul Bradshaw as our banquet speaker, delivered a stirring address on patriotism and love of country; then there was Berea, Kentucky in 1959, and Mr. Tillman Bubenger and his stimulating and very challenging address on "Agri-Business, A Challenge to Agricultural Education"; in 1960 and in 1961, there were the presentations by Dr. T. J. Stanley of his research on "Basic Science Requirements in Agriculture Curricula." Numerous others could be named, but these are a few of the addresses and presentations that have been of great value to your organization as it moves toward its objectives.

If we as teachers are to grow, develop, and become more proficient in our respective fields of endeavor — if our departments and our institutions are to rise in stature, the burden of responsibility in accomplishing such is placed upon us as individuals. The purposes for which NACTA was born and for which it exists have been stated; and many dedicated educators have given liberally of their time and experience in bringing it along during these early years. What has been your relationship with **your** association? As in other organizations, members will receive in proportion to their giving and those who feel as though their "receiving" has been rather skimp will find, upon self-analysis, that their "giving" was of the same caliber.

It has been my wish to see us grow — not so much in members, although their importance is certainly not to be ignored, as in quality — and I believe that this is being done. We will continue to pursue and come closer to our objectives for existence through combined individual efforts, and through voluntary as well as requested participation in the program of work of the association. There is no denying that enthusiasm is contagious because as time rolls by, the eagerness with which one accepts a responsibility, and the vigor displayed in doing a given work will be a source of encouragement to others and will instill in them also a desire to be an active member.

Since we also gather strength through numbers, our membership will also feel the impact of the zeal, the participation and the dedication of the individual. Any organization would be pleased with an annual growth of twenty-five percent in membership. If one out of every four members, as of 1961, would be responsible for one new member, your association would be strengthened by sixteen at Fresno in 1962. How long has it been since you told an associate about NACTA and invited him to the conference at Fresno in 1962? Neither a candle nor your association should be placed under a bushel. I am extremely proud of the organization and its accomplishments during its short existence and it has been a pleasure and an inspiration to work and to be associated with its membership.

The National Association of College Teachers of Agriculture has something for every educator and can contribute many intangibles to his becoming a more effective teacher — which I am sure is the goal of every member. You can contribute to NACTA, but even more important, NACTA can give you much more in return.

FROM THE DEAN'S DESK . . .

LLOYD DOWLER, Dean of Agriculture
FRESNO STATE COLLEGE

Fresno State College is looking forward to the National Association of College Teachers of Agriculture convention to be held in Fresno March 18, 19 and 20, 1962. Arrangements have been made with the Hotel Californian to set aside a sufficient number of rooms to take care of delegates, contestants, and special guests.

Since the College will be celebrating its 50th Anniversary it may be interesting to some of those looking forward to visiting the campus to know that Fresno State College had its beginning in 1911 as a normal school. Like most state colleges it was originally designed to train elementary and secondary teachers. Although its primary function was teacher training the law provided for programs in agriculture, home economics, and other vocational subjects. The College was officially designated as a state college in 1935 and at that time it started to expand other major programs within the college. It now has twelve major divisions: Education, Fine Arts, Humanities, Business, Applied Arts, Life Science, Physical Science, Air Science, Social Science, Speech Arts, Agriculture, and Physical Education. The enrollment at Fresno State reached a new high this school year when 6,200 students matriculated for the fall semester.

In 1945 a group of public spirited citizens organized a "six counties agricultural committee" to help promote an expanded program in agriculture. Through the efforts of this committee some $250,000 was raised and turned over to the Fresno State College Fundation, a non-profit corporation. A part of this money was set up in a revolving fund to help promote a practical program in agriculture where students would have an opportunity to engage in farming while pursuing their college education. An agricultural advisory committee was elected to serve in cooperation with the President of the College and the Dean of Agriculture and to assist in the development of the kind of program that would meet the needs of agricultural industry in the San Joaquin Valley. With the beginning of this type of program agriculture at Fresno State was expanded during the 1947-48 school year. Additional faculty was employed to develop a broader curriculum. The legislature provided additional funds for the acquisition of a new campus and the expansion of the farm school program. Most of this activity took place following World War II and the enrollment in the Division of Agriculture started to grow with the addition of staff, the acquisition of land, and the broadening of the curriculum. There were some 55 majors in the Division of Agriculture during the 1947-48 school year and this has grown to approximately 400 majors in 1961. The College is now housed on a new campus some eight miles north of downtown Fresno where it has 1,400 acres of land, 200 of which is devoted to the academic program and 1,200 for agricultural purposes. The Division of Agriculture is now offering fourteen majors: Agribusiness, Agricultural Engineering, Agricultural Inspection, Agricultural Mechanics, Animal Husbandry, Crop Production, Dairy Husbandry, Dairy Industry, Enology, Hortliculture, Ornamental Horticulture, Poultry Husbandry, Viticulture, and General Agriculture, as well as a teaching major in general agriculture leading to a General Secondary Credential.

It has been the policy of the College to encourage young people to gain as many "learn by doing" experiences as possible during the four years they are enrolled in the agriculture program and each year some 100 or more students participate in such projects as growing cotton, barley, corn, commercial fruit tree enterprises, or engaging in the production of fresh table grape, wine grape, or raisin grape projects. A maximum of five acres of land is made available in these enterprises. In the livestock program students may feed out show steers as individuals or in carload lots, or they may have a regular commercial steer type project where they are fully responsible for the care, management, and marketing of their livestock. Projects are also conducted in feeder pigs, feeder lambs, in commerical egg production, fryer and turkey projects. The College believes this kind of learning process ties together and gives a great deal more meaning to the lecture and laboratory work carried on as a regular part of the instructional program. The students share in the profits from their projects on an approximate two-thirds/one-third ratio, the student receiving two-thirds of the gross profit, from which he must pay his expenses, and one-third is returned to the Foundation to help perpetuate the project program.

From the beginning the College decided to train livestock, dairy cattle, and dairy products judging teams and to enter them in contests with the land grant colleges. It was the feeling of the faculty that this would give us an opportunity to evaluate the effectiveness of our instructional program and to publicize the agriculture program on a regional and national level. Teams from Fresno State College have consistently been at the top in such intercollegiate contests as the Pacific International Livestock Exposition at Portland, Oregon; the Grand National Livestock Exposition at San Francisco; the Gilden Spike Exposition at Ogden, Utah; the Great Western at Denver, Colorado; the Great Western at Los Angeles. Dairy cattle judging teams that have placed first at either Portland or San Francisco have been permitted to compete in the national dairy cattle judging contest at Waterloo, Iowa. We were extremely proud when our dairy cattle judging team placed fifth out of twenty-seven colleges in this contest in 1960. We believe that we have demonstrated quite well the fact that a non-land grant college can train young people in these skills and abilities just as effectviely as the land grant colleges. There are many other

examples I could recite to illustrate how we are performing other phases of the instructional program just as effectively as the land grant colleges. We are anxious to try and keep our standards and our entire program geared to the needs of those young people interested in a B.S. degree in agriculture. Since the expansion of the agricultural program in 1947-48 the Division of Agriculture has graduated over 700 students and there has been a greater demand for trained personnel than the Division has been able to fill.

We hope this gives you a little information about the College and the agriculture program in particular. It is hoped that faculty and students planning to attend the convention will have some time to visit important agribusiness industries of the San Joaquin Valley. For those who have not had opportunity to see San Francisco, this should be placed on the agenda. This is one of the most beautiful cities in the United States and it is only 180 miles north and west of Fresno. For additional information concerning other interesting points (Yosemite National Park, 90 miles to the north, and Sequoia National Park, 40 miles to the south), you may write to the Fresno Convention Bureau, Memorial Auditorium, Fresno, California.

————NACTA————

CHANGE IN NAME TO BE CONSIDERED

A constitutional amendment providing for a slight change in the name of our organization is to be considered at the business session to be held at 1:30 p.m. March 20, 1962, at Fresno, California.

At the 1960 annual meeting held at Springfield, Missouri, Dr. E. E. Puls of Southeastern Louisiana College suggested that the name of the National Association of College Teachers of Agriculture be changed in order to permit the solicitation of institutional memberships.

The executive committee, meeting in Memphis, Tennessee in June, 1961, unanimously approved the suggestion that the matter be placed before the general membership at the annual meeting in 1962.

The change which the committee suggests is so slight that many members will scarcely be able to recognize the difference, yet it is sufficient to aid the envisioned new role of our organization. The proposed name is THE NATIONAL ASSOCIATION OF COLLEGES AND TEACHERS OF AGRICULTURE.

Also to be considered at this same session is a second amendment to the constitution which will provide for the acceptance of institutional memberships from schools, colleges, and universities teaching agriculture.

At least five reasons exist for the desirability of institutions being officially affiliated in a strong national organization interested in promoting high standards in member colleges teaching agriculture. These reasons are as follows:

1. Although the NACTA is the only organization in America which exists primarily for the advancement and improvement of college teaching of agriculture, it is felt that its effectiveness would be even greater if it represented not only teachers of agriculture but also the institution in which they teach.
2. Although NACTA membership has always been available to all college teachers of agriculture, whether they be teaching in land-grant or non-land-grant institutions, almost one hundred percent of the memberships has, thus far, consisted of individuals teaching in schools which have not had the benefit of institutional memberships in a strong, effective, agrciulturally oriented organization such as the National Association of Land-Grant Colleges and State Universities. An affiliation of this kind could conceivably be of equally significant value to non-land-grant colleges teaching agriculture.
3. If the association should ever undertake an accrediting function, the institutional section could serve as the nucleus for this endeavor. Also, the problems of manitenance of standards and transfer of credits between institutions within and without the association could probably be reduced through an affiliation of schools even though a formal accrediting agency may not be found necessary.
4. Although the institutional membership fee suggested is only $25.00 per year, it is felt that the potential number of members is great enough to add considerable financial strength to the association.
5. As individual teachers the members of the association have strived diligently for ever higher standards of excellence in teaching. However, many feel that the implementation of these standards could better be effected by an organization of both teachers and schools.

These two amendments, first to change the name of the organization, and secondly to provide for an institutional membership section, could prove to be landmarks in the history of our society.

Every member of the National Association of College Teachers of Agriculture, and indeed, every potential member should, if at all possible, plan to be in Fresno to help make these historic decisions.

THE LIBRARY AS A LABORATORY

With the ever increasing need of more adequate or modern laboratory facilities being one common problem of most colleges which offer instruction in agriculture, can the proper concept of library use assist in strengthening applied instruction in agriculture? Yes, provided this store of information is thought of as stated purposes, literature reviewed, procedures outlined, methods used, and evaluated results recorded of thousands of experiments far more significant than could possibly be carried on at one single institutional farm or experiment station.

An approach to developing this concept is thinking of available library material as part of practical experience which the student may gain from review of literature related to a particular subject. The function of the necessarily limited individual laboratory experience may be considered as a means of teaching laboratory techniques and illustrating basic principles related to agricultural prolems. While or after this is done, a good library may provide material that can be used to supplement both vertically and laterally problem instruction in agriculture and related sciences.

For one to adopt this laboratory concept of the college library, it is important to consider the purpose of laboratory instruction. Generally we think of a laboratory as a place for application of principles and practices studied in class. Since education has been and will continue to be vicarious as long as teachers, printed material, and other aids are used in instruction, where is there a greater source of applied experiences than those presented in a good library which contains selected classic texts, periodicals, services, bulletins and other assorted references? A major step in the conduct of any experimenattion or application is that of reporting. The reports of most all significant experiments may be found eventually in one source or another in a library.

This laboratory concept of the college library is not in conflict with the estalished educational practice of "learning to do by doing" but rather should be a part of the conventional laboratory activity. This may be appropriately termed, "learning to do by reviewing what others are doing". Would it not be better to think of the library as a part of laboratory instead of a supplement? This idea does not conclude getting away from practical instruction — it would serve to broaden it.

In fact, this concept of library use in agriculture is not new. Libraries have been used as laboratories since the beginning of formal instruction in agriculture on the higher level. By incorporating the library as a part of the laboratory facilities for agriculture in the thinking of the teacher, a great deal more confidence may be gained in what may seem to be a limited program. This would assume that the instructor would be equipped professionally to use effectively available library material.

In this day of mounting educational costs and greater demands on the tax dollar, this concept of library use may take some of the strain off the usual high cost per student incurred in most college programs of agriculture. This would no doubt be sound rationalization in the eyes of administrators and accrediting agencies. It may be a fact that a good job is being done or a better job could be done with limited facilities.

Well formed library usage habits in relation to agricultural problems would serve to make available to the college graduate a personal laboratory to be used as long as he is active professionally.

One of the greatest among many odvantages to be obtained from developing this laboratory concept of the library, is that it lends itself to developing the "thinking student" which is one of the primary aims of the educational process.

———NACTA———

CONVENTION PRE-VIEW

EXCERPTS . . . . .

from a letter written by Dr. Lloyd Dowler to the West Coast Colleges.

. ..the Executive committee, under the direction of President John T. Carter. . .has come up with an outstanding program (for the 1962 conference) that will give every participant a feeling of having gained something worthwhile. There will be livestock, dairy cattle and land judging contests. Ralston-Purina is providing very beautiful trophies to the high teams in the livestock and dairy cattle contests and the California Association of Soil Conservation Districts will present a trophy to the high team in land judging. These presentations will be made Tuesday night, March 20, at the awards banquet. **Mr. J. T. Bell,** Chairman of the Fresno Animal Science Department, will be in charge of the livestock contest. **Mr. R. J. Selkikr,** Professor of Dairy Husbandry will chairman the dairy cattle contest. Professor **W.C. Strong** will have charge of the soils contest.

Several faculty members from our. . . .Departments will report on topics of general interest. Dr. Winston Strong will present a paper on sprinkler irrigation and Mr. O. M. Braun will discuss new developments in the citrus industry. Mr. Jesse Bell will talk on swine nutrition and Dr. Floyd Hixson will discuss certain aspects of high energy rations in commercial egg production. A panel is being planned on the "project program" with representatives from California junior and state colleges participating. Dr. George Mehren will be a featured speaker on some phase of agricultural economics. Another panel will bring together our tri-partite committee in agriculture where junior college, state college and university personnel will be represented.

The NACTA has a national agricultural honorary society referred to as Delta Tau Olpha. DTA is a national organization that recognizes scholastic achievement which is tremendously important to every school offering agriculture. All colleges are encouraged to bring along to the convention one or two students to attend the DTA meetings that run concurrently with our professional meetings.

THE ROLE OF AGRICULTURAL RESEARCH IN NACTA COLLEGES

Editor's Note:
This article is from the 1960 Report of the Research Committee of NACTA and was written by Dr. Burton W. DeVeau, Chairman of the committee. Dr. Hal B. Barker, Associate Editor of the Journal has prepared this article by excertping Dr. DeVeau's original article and by adding a few thoughts.

Dr. Burton W. DeVeau

Previous surveys made by research committees of NACTA indicate that most members are not expected to conduct research, and that several member colleges are actually prohibited from conducting research by their administrative authorities.

We, as an association, can only encourage original research by those who **can** conduct it and certainly we can encourage the utilization of information made available by other researchers. We would not want to encourage all members to conduct research. If such a position were advocated many research projects would be undertaken just for the sake of conducting research and not because of a genuine interest in research. In regard to this position the following quotation is given:

"There is also a tendency for educational agencies to take over research functions. In the case of graduate instruction, research and teaching appear to complement each other enough to justify having a given person employed at both kinds of work. Even here, however, the press of regular teaching assignments breeds inefficiency in the use of research resources. In the case of undergraduate teaching, joint appointments are less justified as complementarity tends to be less valuable while the inefficiency seems more pronounced."

One of the most important responsibilities of the teacher is to help students clarify their values and to teach them to think critically more effectively. A technique which may be used to accomplish this responsibility, particularly with the more gifted student, is the utilization of student research projects.

One purpose of student research is to provide an opportunity for the able student to achieve a greater depth in learning than is possible in an ordinary classroom situation. Providing an opoprtunity for students to achieve a greater depth of learning is vital in teaching them to think critically and in developing versatile minds capable of dealing with the social, economic, and political problems of our era.

There are many other values of student research projects. Such participation provides an opportunity for the imaginative student to test his ability. It helps develop a creative mind. It also creates an interest and a desire in the student to continue his formal education beyond the baccalaureate degree. Student research also provides an opportunity for the faculty research adviser to participate in research projects that he might be unable to conduct alone due to his acdemic load or administrative responsibility. Results of certain student research projects may be used in the classroom situation to support or supplement a principle being taught. These values, among others, should encourage teachers of agriculture to assist and promote student research projects in their field.

There are many types of research projects in which a student may participate. Short-time production projects, such as fertilziation rates for crops, livestock feeding projects, nutrition and light intensity experiments in the greenhouse, and production testing programs provide many varied research opportunities which could be conducted successfully by students with an appropriate amount of guidance. Projects involving historical reviews, surveys of practices, reviews of literature or compilations of existing research would prove to be of considerable value to the student and may be of importance to the adviser involved. Seemingly, there is no area of research in which a student with a keen mind and with appropriate guidance could not make some contribution.

Many universities and departments of agriculture are attempting to encourage their better, advanced undergraduate students to conduct research. There seems to be a growing effort to stimulate students through individual research projects in all areas in many colleges and universities throughout the country. This is evidenced by an increasing number of honors courses for students, an increase of articles in the literature devoted to the superior student ,and the establishment of The Inter-University Committee on the Superior Student which publishes the journal,

The Superior Student.

The values derived from student research projects by the student and his adviser are unmeasurable. As a teaching technique, student research projects have a very important role and could be utilized to great advantage. If supervised properly, they will contribute greatly towards the student's depth of learning and understanding.

Research programs in most colleges represented by NACTA cannot depend generally upon state and federal support, however, research supported by private enterprise has made a major contribution to farm technology. Much of this research has been conducted by staff members of private companies, however, in several instances these firms have supported research projects in educational institutions, including non-land-grant departments of agriculture.

There are probably very few private enterprises which have organized assistance programs for research. However, many organizations will assist in research projects by furnishing materials, technical advice, and, in some cases, funds, if the anticipated research project seems to merit financial support. The NACTA member who is developing a research project in which funds, technical

assistance, and or materials are needed should contact private enterprises in his area which he thinks might be interested in his project and submit a proposed plan to them indicating his needs. Such contacts may prove very fruitful.

There are several non-profit organizations that have regular research assistance programs which may be of interest to NACTA members contemplating research. Assistance from these organizations is usually difficult to obtain. However, assistance is available. If the proposed research project has adequate depth and breadth it will be given appropriate consideration.

The National Science Foundation, Washington, D. C. has a regular research assistance program for technical research projects. Contact may be made through the national office concerning the type of projects for which financial assistance is provided and the requirements for assistance.

The Small Business Administration, Washington, D. C. has an annual research assistance program for research projects affecting a region and concerned with the managment of a business enterprise. The type of research projects supported by the SBA may also include some technical research. The SBA generally grants funds for one research project in each state each year. Therefore, competition for a SBA research grant may be very great, particularly in states where there are Business Colleges seeking such a grant.

The Kettering Foundation, the Tennessee Valley Authority provide funds and other assistance for research related to crops and soils. The Kellogg Foundation and the Ford Foundation provide funds for research projects in general education. Contact should be made with these foundations concerning the requirements for grants and the conditions for conducting research projects with the foundation grant.

Although funds and materials for research are not available to NACTA members to grasp at all times for any research project they may wish to conduct, funds and materials are available if the researcher desires to seek them. The writer, (Dr. DeVeau), believes that sources for materials are virtually limitless and that funds for research are available if the researcher takes the necessary time and effort to seek appropriate sources of funds.

In the opinion of the associate editor, our continuous communication with one another in NACTA, and our favorable relationship with other agriculture colleges is dependent upon the development of a publication of high calibre that will merit a wide circulation. The editorial staff must have available some stable source of constructive information and it is the opinion of the associate editor that these research manuscripts could constitute one desirable source of material for publication. The Publication and Research Committee will continue to encourage the development of the third purpose as defined in the constitution of NACTA. .. . to encourage and promote research in agriculture among members of the association.

Education for Management Of Agricultural Business

HAROLD C. LOVE

University of Houston

Perhaps the six words which form the title of this paper embody the goals of most students and teachers who have strong interests in agriculture. The panorama of events in agricultural industries which has occurred during the lifetime of the students and the working career of most agricultural educators is a story of high adventure. The risks, the ruthless competition, the obstacles, the failures and the successes furnish a real life drama second to none. The curiosity which every individual has concerning his environment adds further suspense to the tale.

Such adventure was forecast by Karl Pearson in his "Grammar of Science" by his definition of science.

> "Science may be described as a classified index to the successive pages of sense impression which enables us readily to find what we want, but it in no wise accounts for the peculiar contents of that strange book of life."

In this paper, I shall concentrate on two types of changes in agriculture and suggest some of their implications for educators in the field: (1) changes in on-the-farm production, (2) changes in farm supply and in the marketing structure for farm products. Limitations of time and space prevent exhaustive examination of even two areas and implications for educators are tentative and subjective. References at the end of the paper are listed to encourage the reader's further investigation.

The agricultural fundamentalists, and a few soil conservationists, have frequently taken the alarmist view with such titles as "Standing Room Only", "Our Plundered Planet" and similar warnings of population's race with production. However large the demand side for farm production appears in the next few decades, the supply side seems even greater. Rate of increase in farm production has consistently exceeded the rate of population growth in the last decade. The average rate of increase in farm production was 2.4 per cent over the 10 year period 1950-59. The average rate of population growth in the United States was only 1.7 per cent in the same period.

This difference in growth rate is small but the margin seems to accumulate substantial surpluses. Too, the low price elasticity of demand for major farm products accentuates the difference in growth rates and causes severe depression of farm prices and income. The low price elasticity of demand causes large supplies of a crop to bring less total income than a small supply. If prices only fell 1 per cent when supplies rose 1 per

cent, income would be virtually unchanged. Unfortunately, relatively few farm products enjoy such a position. For example, past demand studies indicate that at the farm level, for a 1 per cent increase in output, hog prices decline about 2.5 per cent; cattle and calves, veal and poultry by about 1.7; eggs by 5 per cent; dairy products by 5 per cent; and feed grains by about 2.5 per cent. When used for feed, wheat has an elasticity similar to feed grains. However, when wheat is used for food its price decline in response to a 1 per cent increase in output is much greater. The price of an individual commodity also decreases when the quantity of a competing sustitute increases.[1]

Benefits To Society

Competition in agriculture combined with low price elasticity of demand for farm products promotes economic gains for society. The individual farmer is under pressure to improve his technology and increase productivity. The improved production process releases resources from agriculture, chiefly labor, for other functions desired by society. The size of these savings is indicated in Table 1. Today the consumer has a wide variety and quantity of food for selection; moreover, each unit was produced at lower cost. If such improvements had not been forthcoming, more than 45 per cent more resources would have been necessary in agriculture between 1940-59 to provide for population growth and improved nutritional standards.

TABLE 1

Indices of Farm Production and Resources Used U. S. 1940-59

Year	Total Farm Production	Total Farm Resources Used	Resources Per Unit of Production
1940	100	100	100
1945	116	102	89
1950	123	104	84
1955	138	105	76
1959	152	103	68

Source: U. S. D. A.

1. Thus in price elasticity of demand terms at the farm level the percentages in this paragraph would approximate: Hogs—0.4; cattle, calves, veal and poultry —0.6; eggs—0.2; dairy products —0.2; and feed grains—0.4.

The use of more capital resources by farmers has pushed increased production against the inelastic demand for food and fiber. In this situation income per farmer can be maintained only if we have fewer farmers and fewer farms. Societies' saving in resources used in agriculture since 1940 has been in terms of fewer farmers but increased capital investment in adoption of new technology or more extensive use of known techniques in production.

The increase in capital expenditures by individual categories was approximately 135 per cent for machinery, 142 per cent for lime and fertilizer, 125 per cent for feed and livestock and 37 per cent for miscellaneous items. But during this same period, the number of farms declined 30 per cent and total farm labor declined 47 per cent. In summary, the exchange left the total value of resources used about 3 per cent higher than in 1940 while production increased 52 per cent. The consolidation of farms which took place brought about a savings in production. For example when two farms of 160 acres each are consolidated, the new unit no longer needs to duplicate the machinery used on the two previous units. The relative price position of farm inputs is indicated in Table 2. Labor is the highest price resource used while fertilizer is the cheapest.

TABLE 2

Index of Prices Received and Prices Paid By Farmers 1935-59. 1935-39=100

Index of:	1935-39	1945-49	1950-54	1955-59
Prices received by farmers	100	231	252	221
Price of fertilizer	100	132	150	151
Price of machinery	100	130	173	191
Price of labor	100	333	395	455
Price of land (above)	100	188	254	325
Prices paid, all costs	100	184	220	229

Source: U. S. D. A.

During the two decades, land in cultivation remained almost constant but rose in price to 325 points while fertilizer which serves as a substitute rose only 51 points. Machinery rose to 191 but the machines of 1959 and 1960 are larger and more efficient than those of the 1935-39 period and produced declining per unit costs of production. The labor force in agriculture has declined consistently since 1910 when 13.6 million were employed to 11.0 million in 1930 and approximately 7 million in 1960. In contrast, had only 1910 productivity been maintained agriculture would need more than 26 million persons in 1960.

Implications for Educators—Farm Production

Training of the replacements for commercial agriculture has an importance out of proportion to the number so trained. But given the continued high birth rates in rural areas, only 15 per cent of the boys born on farms have an opportunity to return to productive agriculture and operate a commercial farm. The 6.8 million 1961 employment figure for farms includes 3.8 million farm operators, about 1.2 million year-around hired laborers, 900 thousand migratory laborers and 900 thousand seasonal laborers who work in agriculture on a part time basis. Potential college students for training in agriculture will largely come from the 1.9 million commercial farms where the value of sales exceeds $5,000. One indication of the proportion of educational resources to be devoted to training in technical agriculture can be obtained from studies by the National Bureau of Economic Research Incorporated.

TABLE 3
Shifts in Distribution of U. S. Labor Force Among Industrial Sectors, 1890-1920 and 1920-50

Industry	1890		1920		1950		Change 1890 to 1920	Change 1920 to 1950
	No.	Percent	No.	Percent	No.	Percent	(percent)	(percent
	(000)		(000)		(000)			
Farming	9,990	42	11,120	27	7,015	12	+ 11	− 37
Forestry & fishing	180	1	280	1	127	0*	+ 56	− 55
Total primary	10,170	43	11,400	28	7,142	12	+ 12	− 37
Mining	480	2	1,230	3	1,035	2	+156	− 16
Manufacturing	4,750	20	10,880	27	15,930	27	+129	+ 46
Construction	1,440	6	2,170	7	3,940	7	+ 51	+ 82
Transportation & utilities	1,530	7	4,190	10	4,750	8	+174	+ 13
Total secondary	8,200	35	18,470	45	25,758	44	+125	+ 40
Trade & finance	1,990	8	4,860	12	12,650	22	+144	+160
Personal services	640	3	1,630	4	3,600	6	+155	+121
Other services	2,570	11	4,810	11	9,310	16	+ 87	+ 94
Total tertiary	5,200	22	11,300	27	25,560	44	+117	+126
All industries[1]	23,570	100	41,170	100	58,460	100	+ 75	+ 42

* Less than 1 percent.
1. Exclude unallocated workers.
Source: Fabricant, Solomon, "The Changing Industrial Distribution of Gainful Workers." **Conference on Income and Wealth.** Vol. XI. National Bureau of Economic Research, Inc., New York, 1949; and Stigler, George, "Trends in Employment in the Service Industries," National Bureau of Economic Research, Inc., New York. 1956. Comparable data for primary, secondary, and tertiary classification estimated from data in the **U. S. Census of Population, 1950.** Vol. II, Part I.

Trends shown in the preceeding table place heavy responsibility on those who advise high school and college students. Why should society make large capital investments in promoting farm technology (which has the chief aim of displacing farm labor) without investing equally in guiding flexible and enthusiastic farm youth into training for the production of those goods and services most desired by consumers.

II.

The basic structure underlying growth in farm supply and marketing was found in table 3. More specifically the farm supply industries employ six million people. Those industries and commercial enterprises that process, store, handle and merchandise farm products form a third segment of agriculture. Roughly called marketing activities, this segment employs more than ten million people.

In the broadest sense, farm production, farm supply and marketing activities taken together employ more than 35 per cent of the nation's labor force. The three groups represent an important part of our national economy from any point of view. Furthermore, if we are to compete effectively with synthetic products, and other regions of the world, in the competitive market, efficiency in the supply industries as well as the processing and marketing industries is essential. Taken as a group, the three segments have remained relatively constant in size even though the "on-farm" portion is declining.

Farm Supply Industries

Since 1940, the purchased resources used in agricultural production (machinery, fertilizers, hired labor, feed mixing services and additives, pesticides, herbicides, veterinarian services, etc.) have increased by 40 per cent.

The non-purchased items of agricultural production (operator and family labor, real estate and capital produced on the farm) has declined 25 per cent according to the Agricultural Research Service, U.S.D.A. The increase in selected items of current farm operating expense indicates the importance of this part of agriculture although inflation exaggerates the comparison slightly.

TABLE 4
Current Farm Operating Expenses
1940, 1950 and 1960

ITEM	1940 (million)	1950 (million)	1960 (million)
Feed	998	3,283	4,848
Livestock	517	2,004	2,508
Seed	197	531	538
Fertilizer and lime	306	978	1,463
Petroleum, fuel and oil	350	1,192	1,572
Other motor vehicle operations	229	767	1,365
Repairs on buildings and machinery	427	962	1,049
Miscellaneous	708	1,750	2,728
Total excluding hired labor	3,732	11,467	16,071
Hired Labor	1,029	2,678	2,035
Total	4,761	14,145	19,006

Source: Farm Income Situation, U. S. D. A.

Future demand on the farm supply sector, i.e., demand for off-farm production resource items has been estimated by Barton and Daly that production needed in 1965 could be otained on perhaps 40 to 50 million fewer acres of cropland than

we have used in recent years.[1] The authors estimated that by 1975, with projected yield increases, our needs for farm products will require the use of about as much cropland as we have used in recent years. They consider that by 1975, we may need one-third fewer man hours of farm labor or two million fewer workers in farming, but that non-farm expenditures may increase by about 50 per cent and all resources used in farming may increase by 15 per cent.

Farm supply manufacturing industries vary in size from a few large ones to a substantial number that are small. Table 5 overstates the number of firms since some have more than one establishment.

TABLE 5

Selected Farm Supply Manufacturing Industries; Number of Plants and Employees, 1954 and 1958

Industry	Plants with 20 or more employees 1954	1958	Number of Employees* 1954 (thousand)	1958 (thousand)
Prepared animal feeds	685	720	60	59
Tractors	74	68	65	60
Farm machinery, except tractors	397	449	74	75
Insecticides and fungicides	78	90	7	7
Fertilizers	418	406	32	31

*Including those in plants employing less than 20.
Source: 1958 Census of Manufacturers, Preliminary General Statistics, U.S. Department of Commerce, 1959.

1. Glen T. Barton and Rex Daly, "Prospects for Agriculture in a Growing Economy," in **Problems and Policies of American Agriculture**, Iowa State University Press. Ames, 1959.

Growth of the Feed Industry

In terms of dollar volume, Table 4 indicates that the mixed feed industry has increased nearly five times since 1940. In 1954, the largest feed manufacturers accounted for 21 per cent of shipments for the industry. The 20 largest companies accounted for 43 per cent of the total value of shipments. The 1954 census reported 16,530 hay, grain and feed stores with payrolls of 62,337 persons. Keen competition among feed manufacturers takes the form of special services, bulk delivery, discounts on quantity rates and contract arrangements. Bulk handling and special formula consultation service for large users represent new trends to replace price competition.

Farm Machinery Manufacture

Eight companies produce 65 per cent of the sales of the industry. Another 10 per cent of domestic sales are accounted for by 12 to 15 medium sized companies. The 1954 census reported 18,689 retail farm equipment dealers with a payroll of 79,625 persons. Also 46,026 persons were hired by 1,112 farm and garden machinery wholesalers.

Competition among dealers has lead to diversification due to the seasonal nature of demand for many farm implements. Manufacturers have helped some dealers with financing to ease the pressure of heavy capital investment in sales room inventories. Trends in the industry include larger multiple row tillage and harvesting equipment and new materials handling systems for the mechanization of livestock feed operations including cutting, drying, handling and storage of hay. Personalized service to the large individual farms in the form of consultation for the lay out and design of livestock production systems is receiving increasing attention among some equipment manufacturers.

The Fertilizer Industry Growth

In 1958, 2.37 million tons of nitrogen were used as fertilizers as compared with 1.5 million tons in 1951. Excess capacity for the manufacture of nitrogen, due to conversion of World War II government munition plants, has been a major factor in making fertilizer one of the best bargains in farm supply. Manufacturers and distributors have sometimes by-passed dealers and sold direct to large farm users. As in the case of livestock feed, competition is keen and some emphasis has been placed on bulk delivery and handling to reduce bag costs.

Farm Credit

One feature of farm supply is that of credit for purchase and operation of farms. Inspection of the 1961 balance sheet of agriculture reveals that individuals hold 5.4 billion, insurance companies 2.98 billion, Federal Land Bank 2.54 billion, commercial banks 1.62 billion, and Farmers Home Administration .48 billion of the nation's farm-mortgage debt. During the past 12 years, 1950-61, Federal Land Bank loans have increased 180.2 per cent. Total farm mortgage debt increased 134.8 per cent for the period.

Marketing Activities

Today's market for most farm products is nation wide. Moreover, marketing takes a larger share of the consumers expenditure. In 1958, consumers spent 86.1 billion for food and non-food items. The farmer received an estimated $23 billion or approximately 27 per cent of consumer expenditures.

Changes in labor used in marketing food products relative to changes in number of workers on farms suggest the increased importance of food marketing services. During the period 1939-1959 the number of full-time jobs in marketing domestically produced food products rose from 3.8 million to 5.3 million, an increase of 40 per cent. During this same period, the number of farm workers declined by one-third. One of the important avenues of agricultural adjustment involves cost reduction to improve the competition position of our farm products with foreign farm products and with synthetic substitutes. Opportunities for increasing efficiency will be found in the off-farm industries of food and fiber production, processing and distribution as they now comprise two-thirds to three-fourth of the total employment and total cost. Cost reduction in the farm supply industries should reduce farmers' costs.

Implications for Educators

With farm supply and marketing activities bulking so large in the total agricultural scene,

vocational guidance to these fields and provision for effective training in those sciences and skills needed are highly appropriate.

(See Reference Page 18)

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NACTA

FLUID MECHANICS OF A ROPE PUMP

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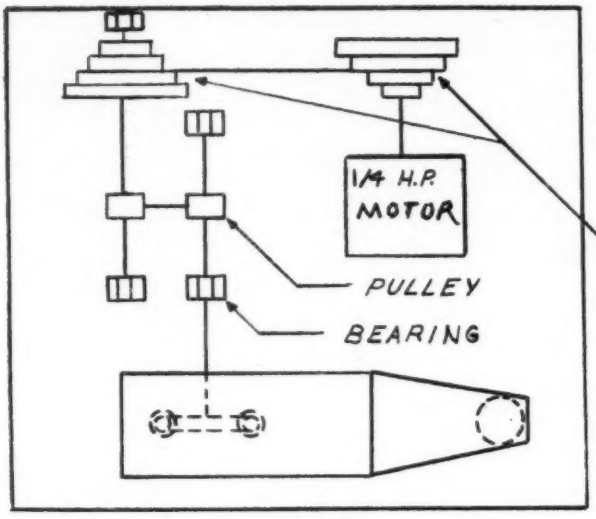
INTRODUCTION

It is possible to raise water vertically by using a continuous rope moving around two pulleys. The lower pulley must be submerged and the water being lifted will be discharged at the upper pulley. Langharr (1) reported that by using cotton clothesline he was able to lift 11 gallons of water per minute through a vertical distance of 25 feet. He used a double pulley driven by an electric motor and two cotton clotheslines. The clotheslines were not enclosed in a tube.

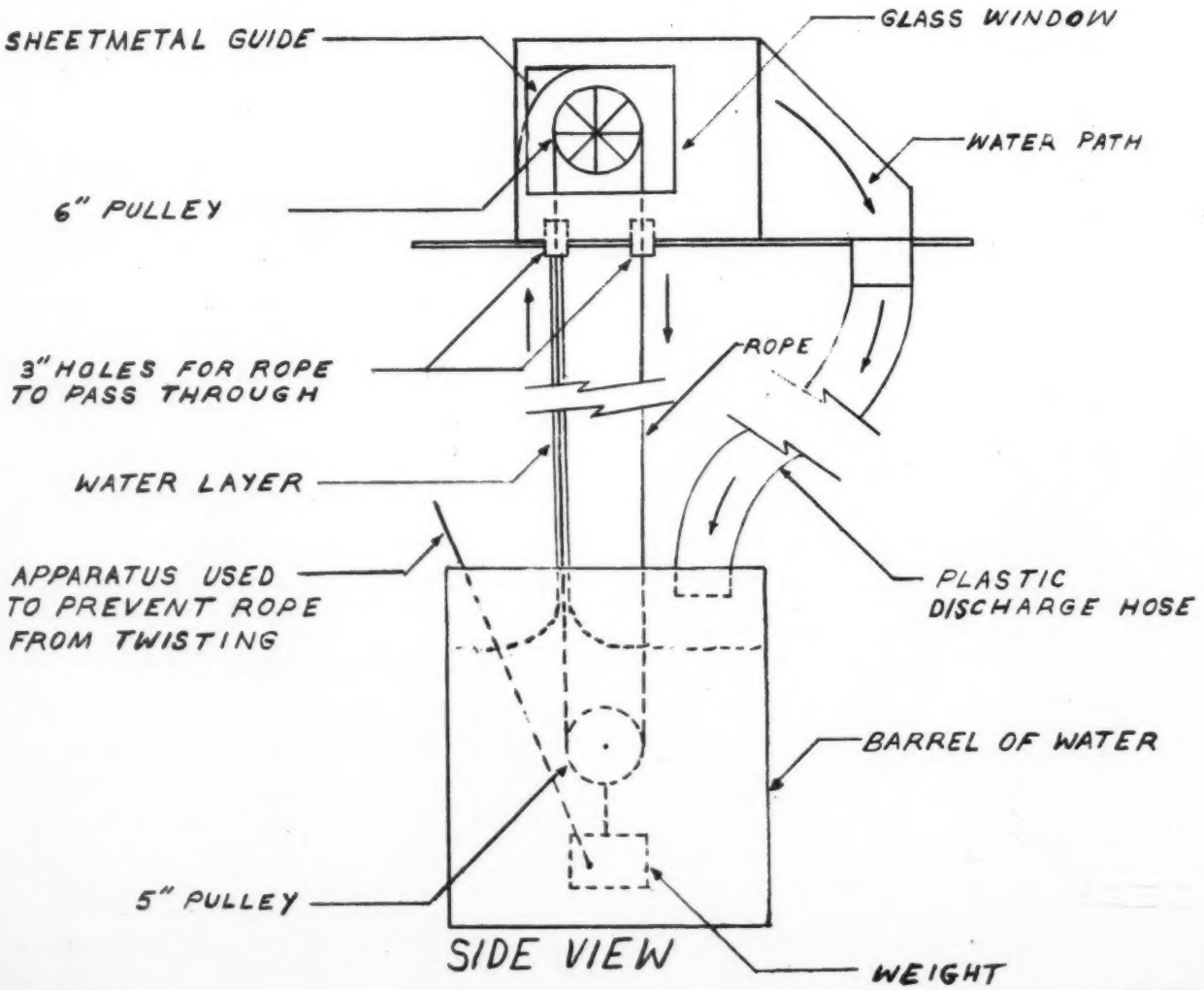
The objectives of the experiments reported

FIGURE 1

SKETCH OF THE PUMP USED IN THE STUDY



TOP VIEW



SIDE VIEW

here were to study the fluid mechanics of a rope pump and, if possible, to arrive at an equation that would describe the behavior of rope pumps in general, and to determine if rope pumps were effective and efficient enough to have practical applications.

The apparatus used in the experiments described in this paper is shown in figure 1.

ANALYSIS OF THE PROBLEM

From observation of a rope pump built by agricultural engineering students for an exhibit at engineers day and from observations of fluids moving down exposed vertical surfaces, the following analysis, using principles of fluid mechanics, was made by the author.

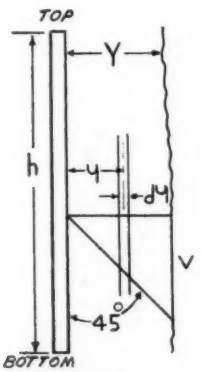


FIGURE 2
WATER FLOWING DOWN A VERTICAL SURFACE

Consider a vertical plane with a layer of fluid moving down one face (figure 2): if the attraction between the plane and the water is strong enough, there will be zero velocity in at least the first layer of molecules. If this attractive force is made stronger, more than one layer of molecules will be immobilized relative to the plane. At some point, however, this attractive force will be reduced enough by space to allow gravity to accelerate the water molecules downward. At some distance away from the plane the attractive force becomes negligible; at which distance, the only force opposing the gravitational pull is the force caused by vicosity of the fluid.

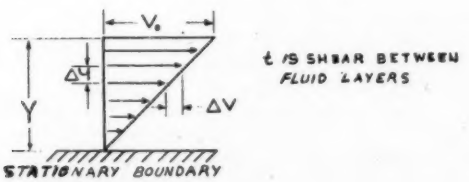


FIGURE 3
THE DEFORMATION OF A FLUID PASSING PARALLEL TO A STATIONARY BOUNDARY

The deformation of a fluid passing parallel to and over a stationary plane boundary is shown in figure 3. According to Rouse (2), shear between layers of fluid can be described by the relation:

$$S = \frac{dv}{dy}.$$

For the situation described, if the flow is laminar and the velocity distribution is a straight line then: $S = m \frac{V}{Y}$

Where S is shear per unit area, m is viscosity, V is maximum velocity, and Y is the thickness of the fluid layer. The total force on the plane in figure 2 is then: $F = ShC = m \frac{V}{Y} hC$ (1)

Where h is the height of the board, C is the width in contact with the water and F is the total force.

If there is no acceleration of the fluid on the plane and if the layer of stationary water is of negligible thickness, the force on the plane is also: $F = hCYP$ (2)

Where P is the density of the fluid. Equating (1) and (2): $m \frac{V}{Y} C = CYP.$

Simplifying: $Y^2 = \frac{mV}{P}$ (3)

Quantity of water moved.

If the plane is moved continuously upward out of a reservoir, water will be moved upward.

It appears that the velocity of the outer layer of fluid will be exactly equal to the upward velocity of the plane but in the opposite direction; that is, the outer layer is stationary with respect to the pool and the inner layer is moving upward with velocity V. If this hypothesis is true, then the weight of water moved is: $Q = C \frac{V}{2} YtP$ (4)

Where t is time. Solving for Y in equation (3) and substituting into equation (4):

$$Q = CPt \frac{V}{2} \left(\frac{Vm}{P}\right)^{\frac{1}{2}} \quad (5)$$

Energy Relationships.

In the analysis of energy relationships, the same assumptions are made as those used above. Additional assumptions made are that there are no losses below the surface of the pool and that no water is accelerated that is not carried upward with the plane.

The energy involved then includes (1) work done in lifting the fluid, (2) fluid friction on the plane caused by the velocity gradient, and (3) the work done in accelerating the fluid. Work in lifting the fluid is Qh and likewise the friction losses are Qh. The first statement comes from the concept of work. The second can be seen to be true from the fact that velocity relative to the pool surface varies from zero to a maximum in a linear manner. If the velocity upward were constant, the quantity of water moved would be proportional to V instead of $\frac{V}{2}$. Since it is proportional to

$\frac{V}{2}$, one-half of the energy is lost as fluid friction. The work done in accelerating the fluid might appear to be $\frac{QV^2}{2g}$; however, since the velocity varies with thickness of the layer, this is not true.

The weight of a small strip of water extending the width of the plane which is moved upward in a given time, t, may be represented by: $dw=CPtvdy$

Also: $v = \frac{V}{Y} y$

Then velocity energy of the differential quantity is:

$$dE = \frac{dW}{2g} \frac{(V)^2}{}$$

Substituting: $dE = \frac{t C P V^3}{2g\ Y^3} y^3 dy$

intergrating this between o and Y gives:

$E = \frac{C P V^3 Y t}{8\ g}$.

Substituting equation (4) in this gives: $E = \frac{QV^2}{4g}$

Efficiency is given by the expression:

$$e = \frac{Qh}{2Qh + \frac{QV^2}{4g}} = \frac{h}{2h + \frac{V^2}{4g}} \quad (6)$$

From this equation it appears that the efficiency will always be less than 50 per cent.

PROCEDURE

The construction of the apparatus used is illustrated in figure 1. It consisted of a 6" diameter pulley in a suitable enclosure and a 5" diameter pulley which was submerged in the water in the barrel. These two pulleys were connected by the pumping rope. The upper pulley was driven by a ¼ horsepower electric motor through step pulleys and a jack-shaft. The step pulleys were used to obtain different rope speeds.

The water laden rope entered the rear hole in the pump housing, and water was discharged from the front of the pump into a plastic discharge hose. The return hole for the rope was just in front of the entry hole for the rope. For the first test the pump was raised 30 feet beside a silo. The rope being tested was threaded through the pump, down through the barrel, and the two ends were connected by the use of a copper tube. This piece of copper tube was only about 1" long. The speed of the rope was determined by counting the number of times the piece of copper tube went through the pulley in a given period of time. The length of the rope was known; therefore, it was a simple matter to calculate the speed. The approximate speeds used were 8 feet per second, 14 feet per second, and 25 feet per second. The ropes used were 12/16-inch perimeter nylon rope, 16/16-inch perimeter sisal rope, 10/16-inch perimeter solid polyethylene rope, 13/16-inch perimeter twisted polyethylene rope, 10/16-inch perimeter cotton window sash, 7/16-inch perimeter cotton cord, and 7/32-inch perimeter of cotton cord. After testing these ropes at 30 feet, the pump was moved down at 5-feet intervals and all tests were run again. The different heights used were 30 feet, 25 feet, 20 feet, 15 feet, and 10 feet. The amount of water pumped at any given speed and at any given height was measured by allowing water to discharge into a container for one minute and then weighing the container and its contents.

Water temperature was measured and recorded. Viscosity was determined by consulting viscosity-temperature tables. Power to the motor was measured with a wattmeter for each run. After all tests were completed, horsepower delivered to the rope was measured by wrapping a string around the pulley and measuring the pull on the string. The pulley speed was measured with a tachometer. Power input to the motor was measured with the wattmeter as it was during the experiments. A curve of motor input power vs power delivered to the pulley was plotted.

ANALYSIS OF RESULTS

Observations. Several unexpected effects were observed during the experiments. One of these was that tension on the rope affected the quantity of water thrown off the rope. When the rope was under considerable tension, less water was thrown off as the rope moved upward than there was when the rope was loose. At the slower speeds, front hole losses were high; that is, a large quantity of the water was carried around the pulley and out at the front rope hole. At higher speeds, this effect was negligible. Most of the water was discharged out of the discharge opening at higher speeds. The small diameter strings seemed to shake off a larger percentage of the water than larger diameter ropes. The probable cause was that the large diameter ropes were stiffer; therefore, there was less vibration to throw the water off.

No controlled observations were made on submergence effect. However, it was observed that unless the lower pulley was submerged to a certain depth, the discharge would be reduced. In the tests conducted, 6" appeared to be enough submergence to prevent any reduction in flow.

It was thought during the derivation of the formulas that the water would flow smoothly down the rope and that there would be no turbulence on the rope above the water surface in the tank. This proved not to be true. At the lower speeds, flow was approximately laminar. Nodules of water did form on the rope but they moved vertically upward at a speed slower than the rope. However, at the high speeds, the water seemed to be turbulent as it moved up with the rope into the pump.

The copper connector seemed to have some effect on discharge, particularly for some of the

ropes. When the connecter went through the pulley it caused the rope to shake and some of the water was lost from vibration.

Inside the pump housing it appeared that water was discharged from the rope in a vertical direction. A piece of sheet metal bent into a smooth curve was placed inside the pump to change the direction of the water 90 degrees.

The shape of the water surface in the barrel during pumping is shown in figure 1. The thickness of the water layer on the rope appeared to be constant after a very short distance above the barrel.

The demonstration referred to earlier and used at engineers day was set up out-of-doors and the wind blew the water off the rope. The rope pump can not be used in an exposed location without shielding it from the wind.

Quantity of Water Discharged. The amounts of water pumped in one minute for the various ropes at the different heights and speeds were recorded. The discharge predicted for one minute was calculated with the formula derived earlier. The quantity measured was always greater than the amount predicted by the equation as is shown in table I.

TABLE I

The ratios of Q measured, to Q predicted are for the two highest speeds at all lifts

Rope	Q Measured / Q Predicted	95 Percent Confidence Interval
Smooth polyethylene	1.2	.2
Twisted polyethylene	1.4	.2
Window sash cord	2.2	.6
Large cotton cord	2.2	.2
Small cotton cord	1.5	.4
Sisal	5.3	.6
Twisted nylon	2.2	.4

These ratios are means for the two higher speeds at all heights at which the ropes were tested. The lowest speed was omitted because it was observed that a large percentage of the water lifted came back down through the front rope hole.

If the equation were correct, the ratios shown in Table I would be unity. It appears that the hypothesized velocity distribution on the rope may be wrong. Perhaps there is an appreciable layer of water on the rope that is immobile. If this hypothesis is correct the proposed equation can be corrected by multiplying by a constant ,k, that is proportional to the immobile layer thickness. The equation would then be:

$$Q = kCPt \frac{V}{2} \left(\frac{Vm}{P}\right)^{\frac{1}{2}} \quad (5a).$$

The constants that should be used are the ratios given in Table I.

Effect of Material. It appears that polyethylene is least desirable for producing maximum discharge. Cotton and nylon appear to be about equal. Sisal is best of all. This large discharge probably was caused by the many fibers projecting outward from the surface of the sisal rope. This characteristic probably caused a thicker layer of water to be immobile with respect to the rope.

Effect of Rope Size. It appears reasonable to assume that as rope diameter decreases the discharge would decrease even faster. This would be caused by increased shearing forces per unit area on the face of the rope. The shearing forces are caused by gravity acting on the water. Some evidence is provided to support this statement by the two cotton cords. These cords had the same type surface configuration, one was 7/32 inches in diameter while the other was 7/16 inches in diameter. As would be expected from the above hypothesis the larger cord had a larger discharge co-efficient.

Surface Configuration. The results from the polyethylene ropes seem to indicate that a twisted configuration gave a slightly higher discharge coefficient than a smooth one. Since the confidence intervals for the coefficients overlap considerably, this conclusion should be regarded as tentative.

Effect of Height of Lift. The rate of discharge did not seem to be affected by height of lift. The discharges at 30 feet for the smooth polyethylene rope, sisal rope, window sash and large cotton cord at the two higher speeds were compared to the discharges of the same ropes at the same speed at 10 feet. The average for 30 feet was 17.4 pounds per minute and for 10 feet it was 16.6 pounds per minute. The difference between these two was not statistically significant.

Energy Considerations. Pump efficiencies ranged from less than 1 percent to 29 percent. Efficiencies decreased as height of lift decreased. This was probably caused by the fact that the energy lost from turbulent flow in the barrel was constant for all heights of lift. Depth of submergence of the lower pulley probably had an effect on losses but no data were recorded to test this hypothesis.

According to the expression derived earlier in the paper, efficiency could never reach 50%. The losses caused by turbulence in the barrel were not considered in this expression, and had they been, the predicted efficiencies would have been even lower. The same assumptions were used in arriving at the efficiency expression as were used in finding the expression for discharge. The measured discharges were higher than predicted discharges. It appears that the factors causing discharge to increase might also improve efficiency.

Efficiency was generally high when discharge was high. It was calculated by dividing water-horsepower by horsepower imput to the pump pulley. Table II gives some data on efficiency.

Rope Inside a Small Pipe. When the pump was 10 feet above the water surface, window sash cord was placed inside a ½-inch diameter steel pipe. In this test discharge was 70 pounds of water per minute. Rope velocity was 24 feet/sec. This compared to a discharge of 18.6 pounds/minute without the pipe.

TABLE II

Efficiency of the Rope Pump at Various Heights Speeds and Materials

Efficiency in Percent	Q Measured No./min. Lbs.	ht ft	Velocity ft/sec
Material: Smooth Polyethylene			
7.2	12.4	25.6	30
3.8	3.4	13.6	30
7.0	12.8	26.0	25
3.1	3.5	13.6	25
1.4	2.3	13.0	30
1.8	8.0	22.2	15
0.8	2.0	12.7	15
1.0	7.2	25.1	10
0.3	1.3	12.9	10
Material: Window sash cord			
9	13.5	26.6	30
10	8.5	14.4	30
7	7.1	14.4	25
5	9.1	12.8	20
2	7.2	24.0	15
3	7.8	13.5	15
2	18.2	26.6	10
3	11.8	14.5	10
Material: Sisal			
24	56.0	24.8	30
29	27.7	13.7	30
24	62.0	23.6	25
21	29.0	13.5	20
12	23.0	13.0	20
6	39.0	20.0	15
10	28.0	13.1	15
5	54.0	22.0	10
7	25.9	12.5	10

SUMMARY AND CONCLUSIONS

The purpose of the study reported here was to determine the effectiveness and efficiency of the rope pump. The essential aparatus consisted of a driven upper pulley inside a housing to facilitate discharge and a lower pulley submerged in water. These were connected by the pumping rope. Tests were run at several heights. Height did not appear to affect rate of pumping. Variables that did affect discharge rate were rope material, perimeter, velocity, fluid viscosity, and unit weight of the fluid. The equation proposed to combine these variables is:

$$Q = KCPt \frac{V}{2} \left(\frac{Vm}{P}\right)^{1/2}.$$

The maximum discharge observed was 62 pounds of water per minute for a one-inch perimeter sisal rope. Pump efficiency was 24 percent and rope velocity 23.6 feet per second at this discharge. In another experiment ,not directly connected with the main series, a window sash cord placed inside a ½-inch diameter pipe gave a discharge of 70 pounds per minute. When the cord was not inside the pipe, the discharge rate was 18.6 pounds per minute.

It appears that some form of the rope pump may have practical applications because of its low cost and ease of manufacture.

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IN THE CONVENTION ISSUE

A newsletter has gone out to the members of NACTA asking that material for the February issue be in the hands of the editor by January 15, 1962.

Articles Included:

Program for the 1962 Conference

Preliminary Report on Cross-Country Tour Agriculture-teaching-schools by Mr. Elgin Hall, Orange Coast College.

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Plan to attend the 1962 Conference in Fresno.

————NACTA————

Do you know what ENOLOGY means?

————NACTA————

Scientific articles of lasting interest will be considered for publication in the NACTA Journal.

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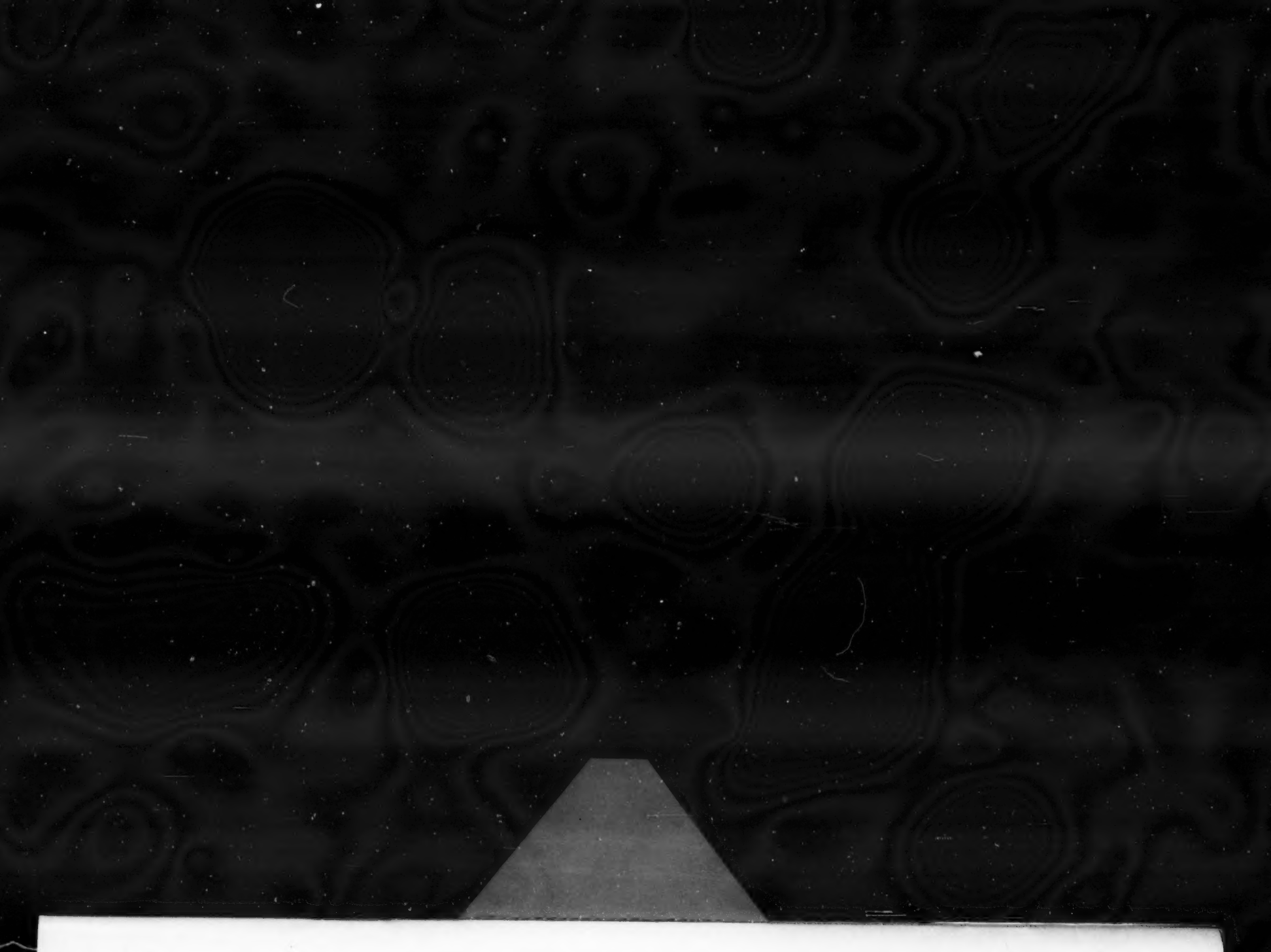

Progress in Completing Conservation Farm Plans

by

Lowell V. Beaverson and Dr. Burton W. DeVeau[1]

The physical problems of conservation vary greatly in different localities. Each state has its own peculiar combination of soil and climate which influence the type and extent of conservation measures required. These problems may even vary in as small a geographical area as a single soil conservation district. While these problems are very important, the success or failure of the conservation movement depends upon the attitudes and the economic situation of the cooperators in the district and upon the ability of the professional conservationist to manipulate these attitudes and resources of the best interests of both the cooperator and the conservation movement.

Several studies have been conducted to determine the obstacles to adopting conservation practices on the farm, and how to deal with these obstacles. Studies by the Missouri Agricultural Experiment Station[2] and by C. R. Hogland[3] reveal six primary obstacles to the completion of conservation practices on the farm: (1) age of the operator, (2) attitudes of neighbors, (3) reluctance to change, (4) reluctance to out-of-the-pocket costs, (5) tenant farming, and (6) desire for high current income.

The purpose of this study was to: (1) determine the obstacles to conservation practices in the Athens Conservation District, (2) determine the effect of economic situations upon the success of the conservation movement, and (3) determine the progress of the conservation movement in the Athens District.

In order to accomplish the objectives of this study interviews were made with five per cent of the cooperators in the Athens District selected at random but in proportion to the total number of cooperators within a given area of the District. A questionnaire was constructed and used as a guide during the interview in order to standardize the interviews. A total of 31 cooperators having 34 farm plans were interviewed. All interviews were conducted by the investigator.

Nineteen per cent of the cooperators had adopted essentially all of the practices listed in their original farm plans. An additional 60 per cent had made substantial progress in applying their plans. The remaining 21 per cent were just starting to adopt their plans or had abandoned them.

Lack of time was given by 40 percent of the farmers and lack of finances by 28 per cent as reasons for non-compliance or non-completion of conservation practices. Finances seemed to have the greatest bearing on the problem as lack of finances usually results in the lack of time. The majority of the farmers interviewed held other jobs in addition to farming. Other reasons given for non-completion were: suspension of farming activities, disagreement with some practices, age, and health of the farmer.

The cooperators generally agreed that the most common reason for completing practices was the fact that they were urgently needed. Some cooperators completed only those practices which would show immediate returns. Most part-time farmers completed those practices that would build up their land so that it would be in good condition when they retired from their outside jos.

A review of the completed practices showed that pasture improvement was planned in all of the basic plans and was progressing in 79 per cent of these plans. Pond construction was the most popular of the recent common practices being planned. Ponds were being planned on 26 farms with 61 per cent completed.

Other practices planned in over two-thirds of the farm plans were: wildlife area improvement, contour stripping, tree planting, waterway development, contour farming, and pond improvement. These practices reflect the typography of the Athens District and were completed on one-third of the farms for which they were planned.

The majority of the farmers were enthusiastic about their conservation plans and the assistance they were receiving from the SCS technicians. One-third of the farmers indicated they desired to plan other conservation practices in addition to the ones specified on their original plans.

Progress is difficut to measure. In conservation practices it must be based upon the number of plans completed and upon the degree of application of practices in the incomplete plans. In the studies previously cited the percentage of completion ranged from 10 to 30 per cent with 20 to 33 per cent of the farmers indicating no progress. The study of the Athens District revealed a 19 per cent completion of plans with approximately 60 per cent indicating substantial progress. A comparison of the results of this study and the ones previously cited reveals that progress in applying conservation practices is very similar. However, there are basic differences in the reasons given for not applying the planned practices. These differences may be attributed to the physical characteristics and the economic status of the area studied.

1 This is a brief summary report of an extensive University honors project conducted by Lowell V. Beaverson during his senior year as an agriculture student at Ohio University under the supervision of Dr. Burton W. DeVeau. Mr. Beaverson is a member of Delta Tau Alpha.

2 University of Missouri College of Agriculture, Agricultural Experiment Station Bulletin, **Obstacles to Conservation on Midwestern Farms**, Bulletin 574 (Columbia; North Central Regional Press, 1952)

3 C. R. Hogland, **Soil Conservation in Michigan, Progress and Problems,** Department of Agriculture Economics, Michigan State College, Special Bulletin 394 (East Lansing: Michigan State College Press, 1955)

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OUR 1962 CONFERENCE

Place: Fresno State College, Fresno, California.

Dates: Sunday, Monday and Tuesday, March 18, 19 and 20, 1962.

Program Chairman; Dr. Lloyd Dowler, Dean of Agriculture, Fresno State.

NACTA President: John T. Carter, University of Houston, Houston, Texas.

NACTA Secretary: W. Clyde Hyder, Tennessee Tech, Cookeville, Tennessee.